Recent Extensions to the Dynamic ADI Method

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Alternating Direction Implicit (ADI) have proven extremely useful in recent computer modeling activities at Lawrence Livermore National Laboratories. ADI methods offer advantages such as stability to large time steps in time splitting algorithms and relatively simple splitting operations for matrix inversion. Until recently, we have found ADI relatively slow to converge in elliptic applications. The Dynamic ADI method (DADI) dramatically improves this situation while by adaptively selecting the "acceleration" or iteration parameter. In addition, recent ADI extensions offer these same rapid convergence advantages with new curved internal boundaries and massively parallel capabilities. We will present these concepts starting with the basic DADI extension to ADI and progress to our recent successes with DADI applied to strongly coupled equations, occurring in low-frequency electromagnetic applications. The Coupled Equations DADI method not only has provided solutions in excess of 500 times faster than competing methods but also shows much promise in similar problems in other disciplines.

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